Claims:

1. A method of measuring the dilution of phase modulated spins, from which the macromolecular proton concentration involved in magnetization transfer can be calculated, from two or more scans of an object with a magnetic resonance imaging device, comprising the steps of:
- applying a first RF pulse of flip angle α_1 at a first time so as to generate a transverse magnetization in said object;
- applying a first magnetic field gradient along a predetermined direction in said object so as to produce a phase modulation of ^1H spins along the direction of the gradient;
- applying a second RF pulse of flip angle α_2 at a second time τ_1 seconds after said first time so as to flip the transverse magnetization into the longitudinal plane;
- applying a third RF pulse of flip angle α_3 at a third time $\tau_1+\tau_2$ seconds after said first time so as to manipulate the longitudinal stored magnetization or as to leave the longitudinal stored magnetization unaffected;
- applying a fourth RF pulse of flip angle α_4 at a fourth time $\tau_1+\tau_2+\tau_3$ seconds after said first time so as to flip the longitudinal stored magnetization into the transverse plane;
- applying a second magnetic field gradient along the same predetermined direction as said first magnetic field gradient;
- detecting a stimulated echo at a fifth time.

2. A method according to claim 1, wherein the spins of ^{13}C, ^{14}N, ^{19}F, ^{23}Na, ^{31}P, or ^{35}Cl nuclei are phase modulated.

3. A method according to claim 1 or 2, wherein said third RF pulse is a composite RF pulse.

4. A method according to claims 1 to 3, wherein said third RF pulse is applied with a resonance offset so as to saturate partly or fully the magnetization associated to the macromolecular pool.

5. A method according to any one of claims 1 to 4, wherein said third time is altered over several subsequent scans.

6. A method according to any one of claims 1 to 5, wherein said pulse sequence is a pulse sequence for multislice imaging.

7. A method according to any one of claims 1 to 6, wherein said pulse sequence incorporates an additional encoding gradient for 3D imaging.

8. A method according to any one of claims 1 to 7, wherein said fourth RF pulse is replaced by a train of RF pulses with a flip angle < 90° in order to acquire more than one line in k-space per repetition.

9. A method according to any one of claims 1 to 7, wherein said stimulated echo is sampled with a multi-shot or single-shot echo planar imaging technique.

10. A method according to any one of claims 1 to 9, wherein the object is a patient, and wherein the first RF pulse is synchronized using electrocardiographic gating or peripheral pulse gating.

11. A method according to any one of claims 1 to 10, wherein the object is a patient, comprising controlling the respiratory motion of the patient during application of the pulse sequence.

12. A method according to any one of claims 1 to 11, comprising determining a longitudinal relaxation rate from the sampled data, whereas a spin echo is sampled additionally at a time $2\tau_1$ after said first time.

13. A method according to any of claims 1 to 12, wherein said object is the brain tissue of a patient and the macromolecular proton concentration represents myelin density of said patient.

14. A method according to any of claims 1 to 13, wherein said object is the myocardium of a patient and the macromolecular proton concentration reflects fiber density and structure and therefore tissue quality.

15. A method according to any of claims 1 to 14, wherein the

macromolecular proton pool is a contrast agent administered to the object and the macromolecular proton density reflects the concentration of the contrast agent.

16. A magnetic resonance imaging device comprising a magnet (10) which generates a magnetic field about an object (14), gradient coils (18) which apply gradient pulses to said object (14), RF coils (24) which apply RF pulses to said object (14), driving circuitry (16, 22) which drives said gradient coils (18) and RF coils (24), receiving circuitry (30) which receives a signal from said object (14) in said magnetic field upon application of said gradient pulses and RF pulses, an arithmetic unit (34), a display device (36) for displaying said received and processed signals, and a sequence control device (26) which controls said RF coils (24) to generate and apply a first RF pulse of flip angle α_1 at a first time so as to generate a transverse magnetization in said object (14) and a second RF pulse of flip angle α_2 at a second time τ_1 seconds after said first time so as to flip the transverse magnetization into the longitudinal plane and a third RF pulse of flip angle α_3 at a third time $\tau_1+\tau_2$ seconds after said first time and a fourth RF pulse of flip angle α_4 at a fourth time $\tau_1+\tau_2+\tau_3$ seconds after said first time so as to flip the longitudinal stored magnetization into the transverse plane, and which sequence control device (26) controls said gradient coils (18) to generate and apply first and second magnetic field gradients along a predetermined direction in said object (14) and which generates an image of a stimulated echo detected by said receiving circuitry (30) at a fifth time.

17. An imaging device according to claim 16, wherein said arithmetic unit (34) further calculates images of the macromolecular proton density.

18. An imaging device according to claim 16 or 17, wherein said sequence control device (26) is programmed to perform said third RF pulse with a resonance offset so as to saturate partly or fully the magnetization associated to the macromolecular pool.

19. An imaging device according to any one of claims 16 to 18, wherein said sequence control device (26) is programmed for al-

tering said third time over several subsequent scans.

20. An imaging device according to any one of claims 16 to 19, wherein said sequence control device (26) controls the gradient amplifiers (16) such as to sample a signal with a digitizer (32) according to the multi-shot or single-shot echo planar imaging technique.

21. An imaging device according to any one of claims 16 to 20, characterized in a synchronization unit (42) connected with a device for measuring the electrocardiographic activity of a patient for synchronisation of the first RF pulse with the electrocardiographic activity of the patient.

22. An imaging device according to any one of claims 16 to 21, characterized in a controlling device (44) for controlling a respiratory motion of a patient during application of the pulse sequence.

23. An imaging device according to any one of claims 16 to 22, wherein said sequence control device (26) is additionally programmed to sample a spin echo at a time $2\tau_1$ after said first time, in order to determine the longitudinal relaxation rate.